

Penn Cambria Curriculum

Course Name	Honors Keystone Biology I
Length of Course	<i>1 credit (1 period per day for 1 semester in a block schedule- 1.05 GPA weight)</i>
Grade Level	<i>Generally scheduled in Grade 10</i>
Prerequisites	<i>85% in Honors Earth/Environment or 93% in Earth Environment</i>
Course Description	<p><i>This is a more rigorous course that includes the same units and content as Biology I. However, this course will involve a more in-depth study of the content including additional information, readings, activities, discussion and evaluations.</i></p> <p><i>Major topics of study include: Biology, Scientific Methods in Biology, the Chemical Basis of Life, Cell Biology, Genetics, Evolution, and Ecology. The course also includes an in-depth study of the microscope and a frog dissection.</i></p> <p><i>Students must take Honors Biology I in order to meet the prerequisite for dual enrollment college credit offered in Honors Biology II.</i></p> <p><i>** This course will serve as preparation for the PA Keystone Biology assessment.</i></p>
Units of Study	<p><i>Principles of Biology</i></p> <p><i>Chemical Basis of Life</i></p> <p><i>Microscope Study</i></p> <p><i>Cellular Structure and Function</i></p> <p><i>Homeostasis and Transport</i></p> <p><i>Cellular Energy</i></p> <p><i>Cellular Reproduction</i></p> <p><i>Sexual Reproduction and Human Genetics</i></p> <p><i>Molecular Genetics</i></p> <p><i>Genetics and Technology</i></p> <p><i>Evolution</i></p> <p><i>Ecology</i></p> <p><i>Community Ecology</i></p> <p><i>Population Ecology</i></p> <p><i>Biodiversity and Conservation</i></p> <p><i>Organizing Life's Diversity</i></p>
Materials	<p><i>Text: <u>Glencoe Biology</u> c2007</i></p> <p><i>Supplemental Materials:</i></p>

Keystone Examination Course

Keystone Assessment Anchor alignment is found in parenthesis after course objectives

Assessments/ Measurement of Objectives:

- Objective quizzes and tests
- Homework
- Projects
- Lab Observations/Reports
- Written responses/writing assignments
- Research projects
- Class work / activities related to objectives
- Reading activities related to objectives

Course PA Academic Standard Alignment (2002 standards)

- 3.1.12 C Assess and apply patterns in science and technology.
- 3.1.12 E Evaluate change in nature, physical systems, and man made systems.
- 3.2.12 A Evaluate the nature of scientific and technological knowledge.
- 3.2.12 B Evaluate experimental information for appropriateness and adherence to relevant science processes.
- 3.2.12 C Apply the elements of scientific inquiry to solve multi-step problems.
- 3.3.12 A Explain the relationship between structure and function at all levels of organization.
- 3.3.12 B Analyze the chemical and structural basis of living organisms.
- 3.3.12 C Explain gene inheritance and expression at the molecular level.
- 3.3.12 D Analyze the theory of evolution.
- 3.8.12 A Synthesize and evaluate the interactions and constraints of science and technology on society.
- 3.8.12 C Evaluate the consequences and impacts of scientific and technological solutions.
- 4.6.12 A Analyze the interdependence of an ecosystem.
- 4.6.12 B Analyze the impact of cycles on the ecosystem.
- 4.6.12 C Analyze how human action and natural changes affect the balance within an ecosystem.
- 4.7.12 A Analyze biological diversity as it relates to the stability of an ecosystem.

Alignment to PA Core Standards for Reading and Writing in Science and Technical Subjects (2014)

- CC.3.5.9-10.A** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- CC.3.5.9-10.B** Determine the central ideas or conclusions of a text; trace's the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- CC.3.5.9-10.C** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- CC.3.5.9-10.D** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context.
- CC.3.5.9-10.E** Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction-force, energy*).
- CC.3.5.9-10.F** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
- CC.3.5.9-10.G** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- CC.3.5.9-10.H** Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
- CC.3.5.9-10.I** Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
- CC.3.5.9-10.J** Read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.
- CC.3.6.9-10.A** Write arguments focused on discipline-specific content.
- CC.3.6.9-10.B** Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- CC.3.6.9-10.C** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.9-10.D** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- CC.3.6.9-10.E** Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
- CC.3.6.9-10.F** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject under investigation.
- CC.3.6.9-10.G** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
- CC.3.6.9-10.H** Draw evidence from informational texts to support analysis, reflection, and research.
- CC.3.6.9-10.I** Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 1: Principles of Biology

Estimated Time: 5-6 days

Core Content: Introduction to Biology – Methods of Science

Curricular Objectives:

Students will:

- Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms. (BIO.A.1.1.1)
- Describe and interpret relationships between structure and function at various levels of biological organization (e.g.; organelles, cells, tissues, organs, organ systems, and multi-cellular organisms). (BIO.A.1.2.2)
- Explain how organisms maintain homeostasis (e.g.; thermoregulation, water regulation, oxygen regulation). (BIO.A.4.2.1)
- Use the steps of the scientific method to conduct and analyze an experiment.

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 2: The Chemical Basic of Life

Estimated Time: 7-8 days

Core Content: Atoms, Elements and Compounds – Chemical Reactions (Enzymes) – Water and Solutions – The Building Block of Life

Curricular Objectives:

Students will:

- Describe the unique properties of water and how these properties support life on Earth (e.g.; freezing point, high specific heat, cohesion). (BIO.A.2.1.1)
- Explain how carbon is uniquely suited to form biological macromolecules. (BIO.A.2.2.1)
- Describe how biological macromolecules form from monomers. (BIO.A.2.2.2)
- Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms. (BIO.A.2.2.3)
- Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction. (BIO.A.2.3.1)
- Explain how factors such as pH, temperature, and concentration levels can affect enzyme function. (BIO.A.2.3.2)

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 3: Microscope Study

Estimated Time: 3-4 days

Core Content: Parts of Functions of a Compound Light Microscope – Use and Care of a Compound Light Microscope

Curricular Objectives:

Students will:

- a. Identify key parts and functions of a compound light microscope.
- b. Demonstrate the ability to use parts and functions of a compound light microscope, including focusing.
- c. Describe and model appropriate use and care of a microscope.

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 4: Cellular Structure and Function
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Estimated Time: 5-6 days

Core Content: Cell Diversity and Cell Theory – Plasma Membrane – Structures and Organelles

Curricular Objectives:

Students will:

- a. Compare cellular structures and their functions in prokaryotic and eukaryotic cells. (BIO.A.1.2.1)

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 5: Homeostasis and Transport
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Estimated Time: 4-5 days

Core Content: Cellular Transport

Curricular Objectives:

Students will:

- a. Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell. (BIO.A.4.1.1)
- b. Compare the mechanisms that transport materials across the plasma membrane (i.e.; passive transport-diffusion, osmosis, facilitated diffusion; and active transport-pumps, endocytosis, exocytosis). (BIO.A.4.1.2)
- c. Describe how membrane-bound cellular organelles (e.g.; endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell. (BIO.A.4.1.3)

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities

- Reading in the content area activities
- Open ended responses

Unit 6: Cellular Energy

Estimated Time: 7-8 days

Core Content: How Organelles Obtain Energy – Photosynthesis – Cellular Respiration

Curricular Objectives:

Students will:

- Describe the fundamental roles of plastids (e.g.; chloroplasts) and mitochondria in energy transportation. (BIO.A.3.1.1)
- Compare the basic transformation of energy during photosynthesis and cellular respiration. (BIO.A.3.2.1)
- Describe the role of ATP in biochemical reactions. (BIO.A.3.2.2)

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 7: Cellular Reproduction

Estimated Time: 5-6 days

Core Content: Cellular Growth – Mitosis and Cytokinesis- Cell Cycle Regulation

Curricular Objectives:

Students will:

- Describe the events that occur during the cell cycle: interphase, nuclear division (i.e., mitosis or meiosis), cytokinesis. (BIO.B.1.1.1)
- Compare the processes and outcomes of mitotic and meiotic nuclear divisions. (BIO.B.1.1.2)

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 8: Sexual Reproduction and Human Genetics

Estimated Time: 12-14 days

Core Content: Meiosis – Mendelian Genetics – Gene Linkage and Polyploidy

Curricular Objectives:

Students will:

- a. Describe and/or predict observed patterns of inheritance (i.e., dominant, recessive, co-dominance, incomplete dominance, sex-linked, polygenic, and multiple alleles). (BIO.B.2.1.1)
- b. Describe how the processes of transcription and translation are similar in all organisms. (BIO.B.2.1.2)
- c. Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g., silent, nonsense, frame-shift). (BIO.B.2.3.1)

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 9: Molecular Genetics

Estimated Time: 6-7 days

Core Content: DNA- Replication of DNA- DNA, RNA and Protein – Gene Regulation and Mutation

Curricular Objectives:

Students will:

- a. Describe how the process of DNA replication results in the transmission and/or conservation of genetic information. (BIO.B.1.2.1)
- b. Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. (BIO.B.1.2.2)
- c. Describe how the processes of transcription and translation are similar in all organisms. (BIO.B.2.2.1)
- d. Describe the role of ribosome, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of protein. (BIO.B.2.2.2)

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 10: Genetics and Technology

Estimated Time: 3-4 days

Core Content: Applied Genetics – DNA Technology – Human Genome

Curricular Objectives:

Students will:

- a. Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy). (BIO.B.2.4.1)

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations

- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 11: Evolution

Estimated Time: 8-10 days

Core Content: Fossil Evidence of Change – Origin of Life- Darwin’s Theory of Natural Selection – Evidence of Evolution – Shaping Evolutionary Theory

Curricular Objectives:

Students will:

- a. Explain how natural selection can impact allele frequencies of a population. (BIO.B.3.1.1)
- b. Describe the factors that can contribute to the development of new species (e.g., isolating mechanisms, genetic drift, founder effect, migration). (BIO.B.3.1.1)
- c. Explain how genetic mutations may result in genotypic and phenotypic variations within a population. (BIO.B.3.1.3)
- a. Interpret evidence supporting the theory of evolution (i.e., fossil, anatomical, physiological, embryological, biochemical, and universal genetic code). (BIO.B.3.2.1)
- d. Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation. (BIO.B.3.3.1)

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 12: Ecology

Estimated Time: 2-3 days

Core Content: Organisms and their Relationships – Flow of Energy in an Ecosystem – Cycling of Matter

Curricular Objectives:

Students will:

- a. Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids). (BIO.B.4.2.1)
- b. Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis). (BIO.B.4.2.2)
- c. Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle). (BIO.B.4.2.3)

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 13: Community Ecology

Estimated Time: 2-3 days

Core Content: Community Ecology – Terrestrial and Aquatic Biomes

Curricular Objectives:

Students will:

- a. Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere). (BIO.B.4.1.1)
- b. Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems. (BIO.B.4.1.2)

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects

- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 14: Population Ecology

Estimated Time: 2-4 days

Core Content: Population Dynamics – Human Population

Curricular Objectives:

Students will:

- a. Describe the effects of limiting factors on population dynamics and potential species extinction.
(BIO.B.4.2.5)

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 15: Biodiversity and Conservation

Estimated Time: 2-4 days

Core Content: Biodiversity – Threats to Biodiversity – Conserving Biodiversity

Curricular Objectives:

Students will:

- a. Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires). (BIO.B.4.2.4)

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses

Unit 16: Organizing Life's Diversity

Estimated Time: 3-5 days (time permitting)

Core Content: History of Classification System – Modern Classification – Domains and Kingdoms – Frog Dissection

Curricular Objectives:

Students will:

- a. Explain the history of the classification system.
- b. Describe the modern classification system, including domains and kingdoms.
- c. Complete a frog dissection

**** See PCSD Board Of Education Policy #105.2 Exemption from Instruction** for guidelines regarding student and/or parent objections to dissection activities.

Suggested Methods of Instruction / Learning Activities:

- Lab activities
- Lab reports
- Simulations
- Individual and/or group projects
- Cooperative learning activities
- Study Stations
- Internet/Website Activities
- Research Activities
- Reading in the content area activities
- Open ended responses